

By improving the efficiency of systems that support the manufacturing process, U.S. industry can realize substantial cost savings. Improvements can be readily achieved with existing technologies and through the application of recognized principles and practices.



BestPractices

www.oit.doe.gov/bestpractices

OPPORTUNITIES AROUND WITH SYSTEMS APPROACH!

Efficient Systems	Potential Savings
Motor-driven systems	up to 50%
Compressed air systems	up to 50%
Steam delivery systems	up to 20%
Combined heat & power	up to 70%
Combustion/process heating	up to 20%
Process heat integration	up to 50%

OIT's BestPractices program delivers energy-saving products, services, and technologies to the energy-intensive Industries of the Future. The BestPractices team has an ever-expanding portfolio of tools—technical experts, software packages, Web sites, and publications—that improve not only energy efficiency, but also the related productivity and environmental performance of manufacturing plants across the country.

BestPractices focuses on plant-wide systems—motors, steam, compressed air, and process heat—where large gains in energy efficiency can be realized. In fact, BestPractices is a collection of all the resources that once made up OIT's Challenge programs—Motor Challenge, Steam Challenge, and Compressed Air Challenge. Manufacturers can benefit from that experience and the BestPractices partnership with Industries of the Future to learn about the most energy- and cost-efficient technologies and practices available.

BestPractices Tools

BestPractices provides the tools, listed below, to help manufacturers identify opportunities for significant energy savings and application of emerging technologies.

INDUSTRIAL ASSESSMENT CENTERS

The Industrial Assessment Center (IAC) Program pairs engineering students and faculty with small- and medium-sized manufacturers that qualify for no-cost energy audits. The IAC team conducts one- or two-day site visits and then delivers energy-use reports to its manufacturing clients detailing its analyses, findings, and recommendations. Within six to nine months, the team follows up with the plant managers.

Since the IAC program was established in 1976, participating manufacturers have achieved an average of \$20,735 annually in energy savings and \$34,195 in annual waste and productivity savings, totaling a cost savings of \$54,930 per assessment. In addition, as a result of decreased energy consumption, manufacturers have reduced emissions of greenhouse gases by 4.89 million metric tons of carbon equivalent. And, not only do manufacturers and the environment benefit from the IAC program, engineering students gain theoretical and hands-on experience in energy and waste management.

PLANT ASSESSMENTS

BestPractices also offers cost-shared plant-wide energy assessments. Annually, BestPractices requests proposals from Industries of the Future manufacturers who are interested in increasing their plants' energy efficiency, productivity, and global competitiveness. Typically, OIT awards 10 to 20 fixed-price subcontracts based on technical quality, approach, cost, and availability of funding. Results of the energy assessments are often documented in BestPractices case studies and articles in the BestPractices newsletter, *Energy Matters*.

SOFTWARE

BestPractices, in partnership with industry associations, has produced three software programs—MotorMaster+, 3E+, and the Pump System Assessment Tool—that manufacturers can use to assess their existing components, make repair and replace decisions, and review equipment lists. In addition, a program that analyzes compressed air systems is currently being developed.

TRAINING

Throughout the year and across the country, BestPractices offers training courses to help end users increase the energy efficiency of their manufacturing plants. Classes range from specific training on using BestPractices tools, for example the Pump System Assessment Tool training series, to more general courses on energy management.

WEB SITE

The BestPractices Web site is the portal to all the BestPractices tools. It provides downloadable software and publications, order information on materials not available on-line, access to industrial partners and their industry associations, the training calendar, general information on the BestPractices initiative, and specific information on how end users and their service providers can get involved with the program.

OIT CLEARINGHOUSE

The BestPractices Program offers its clients, industrial end users, access to technical experts at the OIT Clearinghouse. The Clearinghouse can answer specific inquiries about optimizing the energy efficiency of industrial systems and can provide publications and contacts for further information.

INDUSTRY PARTNERS

By virtue of its partnerships with industry, service providers, and industry associations, BestPractices has a direct pipeline to end users. The BestPractices team can provide manufacturers with OIT's existing tools, up-to-date information on emerging technologies, and news on improved processes.

WHO IS ELIGIBLE?

IAC clients are small and medium-sized manufacturing plants in Standard Industrial Codes 20-39. Plants should be located within 150 miles of a host campus and meet the following criteria to qualify for these free assessments:

- gross annual sales below \$100 million
- fewer than 500 employees at the plant site
- annual utility bills of more than \$700,000, but less than \$2 million
- lack of in-house professional staff to perform the assessment

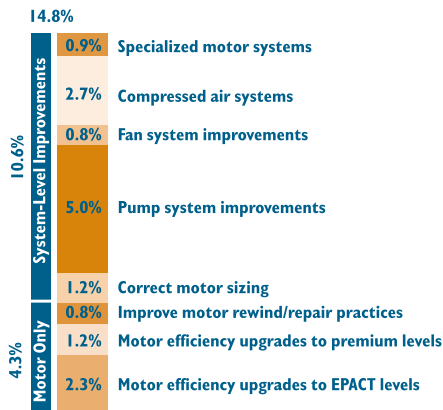


DETAILS OF IAC ASSESSMENTS CONTAINED IN DATABASE

The Office of Industrial Productivity and Energy Assessment at Rutgers University maintains an IAC Database that contains the results of more than 9,500 IAC assessments. The database contains detailed data available by Standard Industrial Classification (SIC), fuel type, base plant energy consumption, and recommended energy-efficiency improvements. Information on projected energy savings, cost savings, implementation cost, and simple payback are provided for each recommended measure.

Specific Industrial Systems

POTENTIAL MOTOR SYSTEMS SAVINGS OPPORTUNITY*



* as a % of total motor system energy use by the manufacturing sector

The BestPractices tools can be applied plant-wide or can be used to analyze and upgrade specific components. Many of the tools are currently focused on the most energy-intensive plant systems—those profiled below—that show the greatest potential for delivering savings.

MOTOR SYSTEMS

More than 1 billion electric motor systems are currently in use in industrial, commercial, residential, and utility power plant applications. Motor driven equipment accounts for 64% of the electricity

consumed in the U.S. industrial sector. The motor systems of the Industries of the Future consume approximately 290 billion kWh per year, or 54% of all energy consumed by industrial motor systems.

BestPractices recognizes the potential energy savings that motor systems represent and has built many of its resources around motor systems energy efficiency improvements. Motor tools include the software collection of MotorMaster+, the Pump System Assessment Tool, and ASDMaster; a large selection of publications from motor-specific tip sheets to motor market assessments to case studies; and an assortment of training programs.

POTENTIAL MOTOR SYSTEMS SAVINGS

TOP 10 MANUFACTURING INDUSTRIES FOR MOTOR SYSTEM ELECTRICITY CONSUMPTION

More than half of the electricity used by motor-driven equipment in the U.S. industrial sector is consumed by just ten industries.

Potential savings from motor systems efficiency improvements in the paper mill industry alone range from nearly \$100 million (low estimate) to \$250 million (high estimate). At the high end, these savings represent nearly 5% of the industry's net income.

Industry	Industry-Manufacturing Motor Systems Electricity Consumption (GWH/Year)	Potential Cost Savings Low to High Range \$MM/Year
Paper mills	55,777	\$103-248
Petroleum refining	40,805	\$119-287
Industrial inorganic chemicals	37,232	\$71-170
Paperboard mills	27,007	\$50-120
Blast furnaces and steel mills	25,323	\$47-112
Industrial organic chemicals	28,721	\$55-131
Industrial gases	21,733	\$41-99
Plastics, materials, and resins	13,667	\$26-62
Cement hydraulic	9,147	\$26-61
Pulp mills	6,402	\$12-28

STEAM SYSTEMS

Two-thirds or approximately 9.3 quads of all fuel burned by U.S. industry is used to produce steam. Steam is used to heat raw materials and treat semi-finished products at a constant temperature. It is also a power source for prime movers and equipment, as well as for building heat and electricity generation.

Because steam is generally produced from inexpensive fuels, it is often viewed as free. Actually, steam accounts for \$21 billion per year of U.S. manufacturing energy costs and 196 million metric tons of carbon equivalent emissions. These emissions represent 13% of total U.S. emissions and 40% of U.S. industrial emissions.

The BestPractices steam systems team is a public-private initiative sponsored by OIT and the Alliance to Save Energy. The steam team works with a broad coalition of participants including steam-related product suppliers and service providers. Among its tools are a Web site; the on-line newsletter, Steaming Ahead; the 3E+ steam system pipe insulation software program; tip sheets; training programs; and handbooks.

COMPRESSED AIR SYSTEMS

Compressed Air Systems account for \$1.5 billion per year of U.S. energy costs and .5% of U.S. emissions. The chemicals, mining, glass, pulp and paper, and petroleum refining industries, among others, use compressed air systems as a power source for tools and equipment and in industrial processes for pressurizing, atomizing, agitating, and mixing applications.

Optimization of compressed air systems represents one of the largest non-process, industrial energy efficiency opportunities. System improvements of 20-50% are achievable through the introduction of a BestPractices approach.

BestPractices' compressed air tools include market and technical reports, fact sheets, and a training series. A compressed air assessment software program is in development.



U.S. industrial compressed air systems consume an estimated 90 billion kWh/year.

